WHAT IS CLAIMED IS:

1. An electrophoresis apparatus having a transport passage adapted to provide a sample solution to be analyzed and at least one separation passage to provide buffer solution, the electrophoresis apparatus comprising:

at least one analyte concentrator at the intersection between the transport passage and the at least one separation passage, and

affinity ligands coupled to at least a portion of the inner wall of the at least one analyte concentrator, the affinity ligands capable of attracting at least one analyte of interest from the sample solution.

2. The electrophoresis apparatus according to claim 1, further including a plurality of valves on the transport and separation passages to surround the analyte concentrator to control the flow of the sample and buffer solutions to the analyte concentrator.

3. The electrophoresis apparatus according to claim 1 or 2, where the analyte concentrator includes a matrix assembly having movable bead microstructures retained within the concentrator by pressure-resistant porous end walls disposed in the transport passage and the separation passage.

4. The electrophoresis apparatus according to claim 1 or 2, where the analyte concentrator includes a matrix assembly having a fixed architecture that is defined by magnetic beaded microstructures capable of being retained by magnetic attraction.

5. The electrophoresis apparatus according to claim 1 or 2, where the analyte concentrator includes affinity ligands that are covalently bound to a portion of the inner wall of the separation passage forming the analyte concentrator, and the affinity ligands are attracted to at least one analyte of interest.

6. The apparatus according to any one of the claims 1 through 5, where each of the analyte concentrators has an encapsulated subcellular structure to carry drug metabolism studies.

7. The apparatus according to any one of the claims 1 through 5, where each of the analyte concentrators has an encapsulated cellular structure to carry drug metabolism studies.

8. The apparatus according to any one of the claims 1 through 5, where each of the analyte concentrators has an acoustic micromixing system to improve the reaction in the analyte concentrators.

9. The apparatus according to claim 8, where each of the analyte concentrators has a microwave pulse system to improve the reaction in the at least one analyte concentrator.

10. The apparatus according to any one of the claims 1 through 9, further including an auxiliary passage coupled to the separation passage downstream from the at least one analyte concentrator to provide separation buffer to the separation passage through the auxiliary passage away from the at least one analyte concentrator.

11. The apparatus according to any one of the claims 1 through 9, further including an auxiliary analyte concentrator downstream from the analyte concentrator on the at least one separation passage, the auxiliary analyte concentrator having affinity ligands capable of retaining chromophores to bind to the at least one analyte of interest released from the at least one analyte concentrator to improve the sensitivity and selectivity of the at least one analyte of interest.

12. The apparatus according to claim 11, where the sample solution has a plurality of proteins with a variety of isoelectric point levels, and the transport passage provides a pH gradient and is subject to an electric field through the transport passage for isoelectric focusing separation of the proteins in the sample solution.

13. The apparatus according to any one of the claims 1 through 12, where the electrophoresis apparatus has a plurality of separation passages, and the transport passage is coupled to each of the plurality of separation passages in a staggered manner.

14. The apparatus according to any one of the claims 1 through 13, where the transport passage and the at least one separation passage are formed from capillaries.

15. The apparatus according to any one of the claims 1 through 13, where the transport passage and the at least one separation passage are formed from channels.

16. The apparatus according to any one of the claims 1 through 15, where the electrophoresis apparatus has a plurality of separation passages, and the transport passage is staggered along at least one of the plurality of separation passages so that the analyte concentrator formed along the at least one of the separation passages is elongated.

17. The apparatus according to claim 16, where the at least one of the elongated separation passages has different set of affinity ligands, where each set of affinity ligands has attraction to different analyte of interest from the sample solution.

18. A system for replacing a plurality of affinity ligands adapted to attract at least one analyte of interest from a sample solution, the system comprising:

a first passage system including a first plurality of analyte concentrators formed at intersections between a transport passage and a plurality of separation passages, where each analyte concentrator has at least one of the plurality of affinity ligands such that the first plurailty of analyte concentrators are adapted to attract a first predetermined set of analytes of interest from a sample solution passing through the transport passage; and

an electrophoresis apparatus having a platform adapted to releasably couple to the first passage system.

19. The system according to claim 18, where each of the plurality of analyte concentrators is surrounded by valves on the transport passage and the respective separation passage to localize each of the plurality of analyte concentrators.

20. The system according to claim 18 or 19, further including a second passage system having a second plurality of analyte concentrators capable of attracting a second predetermined set of analytes of interest that is different from the first predetermined set of analytes of interest.

21. The system according to any one of the claims 18 through 20, where the transport passage and the plurality of separation passages are formed from capillaries.

22. The system according to any one of the claims 18 through 20, where the transport passage and the plurality of separation passages are formed from channels.

23. The system according to any one of the claims 18-22, where each of the plurality of analyte concentrators includes a matrix assembiy that is free and retained within each of the plurality of analyte concentrators by frits provided in the transport passage and the corresponding separation passage.

24. The system according to any one of the claims 18-22, where each of the pluralty of analyte concentrators includes a matrix assembly, where the matrix assemlby is a plurality of microstructures selected from a group consisting of beads, platelets, chips, fibers, polymers, globules, and filaments.

25. The system according to any one of the claims 23 or 24, where each of the plurality of analyte concentrators includes a matrix assembly having movable bead microstructures retained and retained within each of the plurality of analyte concentrators by pressure-resistant porous end walls provided in the transport passage and the corresponding separation passage.

26. The system according to any one of the claims 18-22, where each of the plurality of analyte concentrators includes a matrix assembly having a fixed architecture defined by interconnected beaded microstructures.

27. The system according to any one of the claims 18-22, where each of the analyte concentrators includes a matrix assembly having a fixed architecture that is defined by magnetic beaded microstructures capable of being retained within the analyte concentrator by magnetic attraction.

28. The system according to any one of the claims 18-22, where each of the analyte concentrators includes a matrix assembly having a fixed architecture that is defined by interconnected polymeric microstructures.

29. The system according to claim 28, where the polymeric microstructures are formed from a monolithic lattice.

30. The system according to claim 28, where the polymeric microstructures are formed from a sol-gel lattice.

31. An electrophoresis apparatus comprising:

a plurality of separation passages capable of directing flow of fluid; and

a transport passage coupled to the plurality of separation passages to form a plurality of analyte concentrators at the coupled areas capable of attracting at least one analyte of interest from a sample solution that passes through the analyte concentrators, where the transport passage is staggered along at least one of the plurality of separation passages so that the analyte concentrator formed along the at least one of the separation passages is elongated.

32. The apparatus according to claim 31, further including:

a plurality of valves located on the transport passage and on the plurality of separation passages, where the valves on the transport passage control the flow of the sample solution through the transport passage and the valves on the plurality of separation passages control the flow of fluid through each of the plurality of separation passages, whereby each of the analyte

concentrators can be localized by the valves on the transport passage and the plurality of separation passages.

33. The apparatus according to claim 31 or 32, where the transport passage and the plurality of separation passages are formed from capillaries.

34. The apparatus according to claim 31 or 32, where the transport passage and the plurality of separation passages are formed from channels.

35. The apparatus according to any one of the claim 31 through 34, where each of the analyte concentrators includes affinity ligands that are covalently bound to its inner wall and the affinity ligands are attracted to at least one analyte of interest from the sample solution.

36. The apparatus according to any one of the claims 31 through 35, where the affinity ligands in each of the analyte concentrators include a plurality of different affinity ligands, where each of the different affinity ligands is attracted to a corresponding analyte of interest from the sample solution.

37. The apparatus according to any one of the claims 31 through 36, where each of the analyte concentrators includes a matrix-assembly that is retained within each of the analyte concentrators by pressure-resistant porous end walls disposed in the transport passage and the corresponding separation passage.

38. The apparatus according to claim 37, where each of the separation passages has an inlet and an outlet, where the analyte concentrator for the respective separation passage is between the inlet and the outlet, and further including a second passage coupled to the respective separation passage between the analyte concentrator and the outlet to provide a second fluid to the respective separation passage away from the analyte concentrator.

39. The apparatus according to claim 38, where each of the analyte concentrator is a microextraction device adapted to replace immobilized affinity ligands within the microextraction device.

40. An electrophoresis apparatus comprising:

a plurality of separation passages, each separation passage having an inlet and an outlet capable of directing flow of first fluid from the inlet to the outlet;

a transport passage coupled to the plurality of separation passages to form a plurality of analyte concentrators at the coupled areas capable of attracting at least one analyte of interest from a sample solution that passes through the analyte concentrators; and

an auxiliary passage coupled to at least one of the separation passages between the analyte concentrator and the outlet to provide a second fluid to the at least one of the separation passages so that the second fluid flows towards the outlet and away from the analyte concentrator.

41. The apparatus according to claim 40, further including:

a purality of valves located on the transport passage and on the plurality of separation passages, where the valves on the transport passage control the flow of the sample solution through the transport passage and the valves on the plurality of separation passages control the flow of the first fluid through each of the plurality of separation passages, whereby each of the analyte concentrators can be localized by the valves on the transport passage and the plurality of separation passages.

42. The apparatus according to claim 40 or 41, where the first fluid is elution buffer that passes through the analyte concentrators to release the analyte of interest from the analyte concentrators.

43. The apparatus according to any one of the claims 40 through 42, where the second fluid is a separating buffer provided away from the analyte concentrators and towards the outlet to separate the released analyte of interest.

44. The apparatus according to any one of the claims 40 through 43, where the transport passage and the plurality of separation passages are formed from capillaries.

45. The apparatus according to any one of the claims 40 through 43, where the transport passage and the plurality of separation passages are formed from channels.

46. A method of forming a substantially consistent Fab fragment, the method comprising:

freeing the glycosylated IgG of sugar by at least one glycosidase to form a deglycosylated IgG;

cutting the deglycosylated IgG by pepsin to produce a $F(ab')_2$ fragment;

cutting the disulfide bridge of the F(ab') 2 fragment by mercaptoethylamine to produce two Fab' fragments; and

immobilizing the two Fab' fragments directly to the inner wall of an analyte concentrator using a chemestry break between the fragment and the inner wall.

47. The method according to claim 46, where the two Fab' fragments purify at least one of small-molecular-weight, biomolecule, globule, cellular, and sub-cellular substance present in a solution.

48. The method according to claim 46 or 47, where the solution is a simple solution.

49. The method according to claim 46 or 47, where the solution is a complex solution.

50. A method of identifying a plurality of analyte of interests from a sample solution, the method comprising:

intersecting a plurality of separation passages to a transport passage to form a plurality of analyte concentrators at the intersection between the plurality of separation passages and the transport passage, where each of the analyte concentrators has affinity for at least one analyte of interest from the sample solution; and

staggering the transport passage at each of the plurality of separation passages to elongate the analyte concentrator formed at each of the plurality of separation passages.

51. The method according to claim 50, further including localizing each of the plurality of analyte concentrators to enhance each of the analyte concentrators from attracting the at least one analyte of interest from the sample solution.

52. The method according to claim 51, where the localizing includes:

controlling the flow of the sample solution through the transport passage towards each of the analyte concentrators.

53. The method according to claim 51 or 52, where the step of localizing includes:

controlling the flow of a buffer solution through each of the plurality of separation passages towards each of the respective analyte concentrators.

54. The method according to any one of the claims 51 through 53, where the step of localizing includes:

surrounding each of the analyte concentrators with valves capable of opening or closing the transport passage and the plurality of separation passages.

55. The method according to claim 54, further including:

closing the valves on the plurality of separation passages; and

opening the valves on the transport passage to allow the sample solution to pass through each of the plurality of analyte concentrators to attract at least one analyte of interest from the sample solution.

56. The method according to any one of the claims 50 through 55, further including:

eluting the at least one analyte of interest from each of the plurality of analyte concentrators; and

separating the at least one analyte of interest from other closely related analyte of interest away from each of the respective plurality of analyte concentrators.

57. The method according to any one of the claims 50 through 56, further including:

immobilizing affinity ligands within each of the plurality of analyte concentrators, where the affinity ligands have attraction to the at least one analyte of interest from the sample solution.

58. The method according to any one of the claims 50 through 57, further including:

incorporating affinity ligands having attraction to the at least one analyte of interest from the sample solution within each of the plurality of analyte concentrators; and

retaining the affinity ligands within each of the plurality of analyte concentrators.

59. The method according to any one of the claims 50 through 58, further including:

bonding affinity ligands to a matrix assembly, where the affinity ligands have attraction to the at least one analyte of interest from the sample solution; and

retaining the matrix assembly within each of the plurality of analyte concentrators.

60. The method according to any one of the claims 50 through 57, further including:

bonding affinity ligands to a matrix assembly that is ionized, where the affinity ligands have attraction to the at least one analyte of interest from the sample solution; and

incorporating the matrix assembly within each of the plurality of analyte concentrators; and

magnetizing each of the plurality of analyte concentrators to retain the matrix assembly with the affinity ligands within each of the plurality of analyte concentrators.

61. The method according to any one of the claims 50 through 60, further including:

bonding affinity ligands having attraction to the at least one analyte of interest from the sample solution to the inner wall of each of the plurality of analyte concentrators.

62. The method according to any one of the claims 50 through 61, further including:

purifying at least one analyte present in a simple solution in each of the plurality of analyte concentrators.

63. The method according to any one of the claims 50 through 62, further including:

purifying at least one analyte present in a complex solution in each of the plurality of analyte concentrators.

64. The method according to any one of the claims 50 through 63, further including:

performing a chemical reaction in each of the plurality of analyte concentrators.

65. The method according to any one of the claims 50 through 64, further including:

performing multi-component chemical reactions in each of the plurality of analyte concentrators.

66. The method according to any one of the claims 50 through 65, further including:

performing a biochemical reaction in each of the plurality of analyte concentrators.

67. The method according to any one of the claims 50 through 66, further including:

performing multi-component biochemical reaction in each of the plurality of analyte concentrators.

68. The method according to any one of the claims 50 through 67, further including:

isolating at least one analyte of interest from the sample solution into each of the plurality of analyte concentrators; and

micromixing acoustically the plurality of analyte concentrators to improve the step of isolating.

69. The method according to any one of the claims 50 through 68, further including:

isolating at least one analyte of interest from the sample solution into each of the plurality of analyte concentrators;

microreacting the at least one analyte of interest within each of the plurality of analyte concentrators; and

exposing microwave pulses to the plurality of analyte concentrators to improve the step of microreacting.

70. The method according to any one of the claims 50 through 69, further including:

isolating at least one analyte of interest from the sample solution into each of the plurality of analyte concentrators; and

exposing microwave pulses to the plurality of analyte concentrators to improve the step of isolating.

71. The method according to any one of the claims 50 through 70, further including:

isolating at least one analyte of interest from the sample solution into each of the plurality of analyte concentrators;

microreacting the at least one analyte of interest within each of the plurality of analyte concentrators; and

exposing microwave pulses to the plurality of analyte concentrators to improve the step of microreacting.

72. The method according to any one of the claims 50 through 71, further including:

coiling at least one of the plurality of separation passages downstream from the respective analyte concentrator.

73. The method according to any one of the claims 50 through 72, further including:

isolating at least one analyte of interest from the sample solution into each of the plurality of analyte concentrators; and

controlling the microenvironment of each of the plurality of analyte concentrators to enhance the isolating step.

74. The method according to any one of the claims 50 through 73, further including:

replacing the affinity ligands in each of the plurality of analyte concentrators.

75. The method according to any one of the claims 50 through 74, further including:

conditioning the plurality of analyte concentrators.

76. The method according to any one of the claims 50 through 75, further including:

concentrating the sample solution to form a concentrated sample solution; and

isolating at least one analyte of interest from the concentrated sample solution into each of the plurality of analyte concentrators.

77. The method according to any one of the claims 50 through 76, further including:

replacing the plurality of analyte concentrators with another set of a plurality of analyte concentrators having affinity for a different analyte of interest from the sample solution.

78. The method according to any one of the claims 50 through 77, including:

incorporating affinity ligands having attraction to at least one analyte of interest into each of the analyte concentrators; and

orientating the affinity ligands with respect to each other within each of the plurality of analyte concentrators.

79. The method according to any one of the claims 50 through 78, further including:

releasing the analyte of interest from each of the plurality of analyte concentrators in a predetermined sequential order.

80. The method according to any one of the claims 50 through 79, further including:

releasing the analyte of interest from each of the plurality of analyte concentrators simultaneously.

81. The method according to any one of the claims 50 through 80, further including:

providing an electric field through the plurality of separation passages to pass buffer solutions through the separation passages.

82. The method according to any one of the claims 50 through 781 further including:

pressurizing the plurality of separation passages to pass buffer solutions through the separation passages.

83. The method according to any one of the claims 50 through 82, further including:

vacuuming the plurality of separation passages to migrate buffer solutions through the separation passages.

84. The method according to any one of the claims 50 through 83, further including:

providing a pH gradient and an electric filed through the transport passage;

isoelectric focusing of proteins with a variety of isoelectric point levels in the sample solution through the transport passage; and

separating the proteins by passage electrophoresis through the plurality of separation passages.

85. The method according to any one of the claims 50 through 84, further including:

incorporating affinity ligands having attraction to at least one analyte of interest into each of the analyte concentrators; and

re-using the affinity ligands to attract the at least one analyte of interest from another sample solution.

86. The method according to any one of the claims 50 through 85, where the step of re-using includes:

first conditioning the transport passage and the plurality of separation passages;

passing the sample solution through the transport passage towards the plurality of analyte concentrators;

isolating at least one analyte of interest from the sample solution at each of the plurality of analyte concentrators;

cleaning each of the analyte concentrators to remove unwanted materials present in the plurality of analyte concentrators;

second conditioning of the transport passage and the plurality of separation passages;

eluting each of the analyte concentrators with at least one desired analyte to release the analyte of interest from the step of isolating; and

separating the at least one analyte of interest from other closely related analyte of interest from each of the respective plurality of analyte concentrators.

87. The method according to any one of the claims 50 through 86, further including:

incorporating a plurality of different sets of affinity ligands into each of the plurality of analyte concentrators, where each set of affinity ligands attract an analyte of interest from the sample solution, whereby each analyte concentrator attracts a plurality of analyte of interests.

88. The method according to any one of the claims 50 through 87, where the passage is a capillary.

89. The method according to any one of the claims 50 thorugh 88, where the passage is a channel.

90. The method according to any of the claims 50 through 89, including:

adjusting the temperature at at least one of the analyte concentrators to enhance the at least one of the analyte concentrators from attracting at least one analyte of interest from the sample solution.

91. The method according to any of the claims 50 through 90, including:

acoustically micromixing at least one of the analyte concentrators to improve the reaction in the at least one of the analyte concentrators.

92. A system for detecting biomarkers associated with a disease, the system comprising:

an electrophoresis apparatus capable of isolating a plurality of biomarkers associating with a disease from a specimen and detecting data corresponding to each of the plurality of biomarkers;

a CPU communicateably coupled to the electrophoresis apparatus for operating the electrophoresis apparatus to isolate the plurality of biomarkers, where the CPU is capable of receiving the data corresponding to the plurality of biomarkers; and

a memory having a plurality of reference data corresponding to a plurality of diseases, where the CPU compares the data from the electrophoresis apparatus to the plurality of reference data to determine whether the data corresponds to any one of the plurality of diseases.

93. The system according to claim 92, further including:

an evaluator communicateably coupled to the CPU to analyze the data and provide feedback whether the data corresponds to a disease.

94. The system according to claim 92 or 93, where the electrophoresis apparatus includes a plurality of analyte concentrators formed at the intersection between a transport capillary and a plurality of separation capillaries, where each of the analyte concentrators has at least one affinity ligand capable of attracting at least one biomarker from the specimen.

95. The system according to any one of the claims 92 through 94, where the electrophoresis apparatus includes a plurality of analyte concentrators formed at the intersection between a transport channel and a plurality of separation channels, where each of the analyte concentrators has at least one affinity ligand capable of attracting at least one biomarker from the specimen.

96. The system according to any one of the claims 92 through 95, where the electrophoresis apparatus includes a separation capillary having a plurality of affinity ligands bound to the inner wall of the separation capillary, where each of the affinity ligands is capable of attracting at least one biomarker from the specimen.

97. A method for detecting a disease from a specimen provided by an individual, the method comprising:

providing a sample cup adapted to receive the specimen to analyze whether the specimen has a plurality of biomarkers associated with a disease;

automatically isolating the plurality of biomarkers from the specimen, if any;

detecting data corresponding to each of the plurality of biomarkers; and

analyzing the data to determine whether the data corresponds to a disease.

98. The method according to claim 97, where the step of analyzing is done by an evaluator to determine whether the data corresponds to the disease.

99. The method according to claim 97 or 98, further including:

retrieving a feedback from the evaluator regarding whether the data corresponds to the disease.

100. The method according to any one of the claims 97 through 99, where the step of analyzing is done by:

comparing the data with a plurality of reference data to determine whether the data corresponds to the disease.

101. The method according to any one of the claims 97 through 100, further including:

controlling the step of isolating by a CPU based on a predetermined set of instructions.

102. The method according to any one of the claims 97 through 101, further including:

selecting a system of capillaries with concentrators having affinity for a predetermined plurality of biomarkers associated with the disease; and

incorporating the system of capillaries to a platform of an electrophoresis apparatus.

103. The method according to any one of the claims 97 through 101, further including:

selecting a system of channels with concentrators having affinity for a predetermined plurality of biomarkers associated with the disease; and

incorporating the system of channels to a platform of an electrophoresis apparatus.

104. The method according to any one of the claims 97 through 103, where the step of isolating is done at the individual's desired location.

105. The method according to any one of the claims 97 through 103, where the step of isolating is done at the individual's desired location and the step of comparing the data is done at different locations.

106. The method according to any one of the claims 97 through 105, where the steps of isolating and comparing the data is done at different locations.